BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

REMARKS

Initially, the applicants would like to thank the Examiner for finding allowable subject matter. Applicants have cosmetically amended claims 5, 6, and 14 to overcome the informalities noted by the Examiner. Claims 1, 25, and 31 have been amended to highlight the distinctions between the present invention and the cited art. Limitations similar to those of claims 21 and 22 have been substantially integrated into newly amended claim 1. To avoid any degree of overlap, applicants have cancelled claims 21 and 22 without prejudice. Also, applicants have amended claims 10-12 in accordance with the Examiner's suggestion. Furthermore, applicants have added new claim 35 to more completely claim the present invention. Finally, applicants have replaced FIGs. 10-12 and have made minor revisions to the specification to address several informalities. Applicants believe that the foregoing amendments and the comments that follow will convince the Examiner that the rejections and objections in the July 22, 2003 Office Action have been overcome and should be withdrawn.

I. **THE INVENTION**

The present invention relies upon technology from the applicants' prior invention disclosed in co-pending application "Toroidal Vortex Bagless Vacuum Cleaner," Ser. No. 09/835,084, filed April 13, 2001, which is herein incorporated by reference. The bagless vacuum cleaner of this invention was developed from technology disclosed in the co-pending application "Toroidal and Compound Vortex Attractor," Ser. No. 09/829,416 filed April 9, 2001, which is incorporated herein by reference. These attractors stem from technology disclosed in the co-pending application "Lifting Platform," Ser. No. 09/728,602, filed on December 1, 2000, which is incorporated herein by reference. Finally, the lifting platform technology is based upon technology disclosed in co-pending application "Vortex Attractor," Ser. No. 09/316,318, filed May 21, 1999, which is incorporated herein by reference.

The present invention deals with both toroidal vortex vacuum cleaner nozzles and systems. The nozzles include simple concentric systems and more advanced, optimized systems. Such optimized systems utilize a thickened inner tube that is rounded off at the bottom for smooth airflow from the air delivery duct to the air return duct. It is also contemplated that the nozzle include flow

straightening vanes to eliminate rotational components in the airflow that greatly harm efficiency. The cross section of the nozzle need not be circular, in fact, a rectangular embodiment is disclosed herein, and other embodiments are possible.

The toroidal vortex nozzle is composed of concentric inner and outer tubes. Dust-laden airflow is contained in the inner tube, and cleaned airflow is contained between the outer and inner tubes. Also, straightening vanes are disposed between the inner and outer tubes. These straightening vanes provide non-rotating airflow back to the nozzle. If air is rotating, a significant amount can be expelled from the annulus into the atmosphere, thus compromising the efficiency of the nozzle.

A complete vacuum system utilizing toroidal vortex technology takes in dust-laden air in the inner tube, and returns dust-free air back through the annulus between the inner and outer tubes. Dust-laden air is taken in through an inner tubing leading into the impeller blades. The blades accelerate incoming air into a circular pattern inducing the cylindrical vortex flow in a separation chamber. Alternatively, an axial pump or propeller can be mounted in the inner tube. The inner tube may be swelled out for this purpose. Inside the separation chamber, dirt

and debris are centrifugally separated. The cleaned air is then driven into an annulus formed by the gap between the outer tube and the inner tube. Straightening vanes in the annulus manipulate airflow to eliminate rotational components. Straightened airflow is essential for a toroidal vortex nozzle to perform optimally. If air is rotating, a significant amount can be expelled from the annulus into the atmosphere, thus compromising the efficiency of the nozzle. However, the centrifugal separator is capable of cleaning air without a nozzle. The cylindrical vortex in the centrifugal separator is an inherent part of the dust separation process and is in itself independent of the toroidal vortex nozzle application.

More specific to the separation chamber, a cylindrical vortex is formed such that a circular pattern of flow exiting from the impeller spirals downward along the chamber's outer wall, and then upward along the chamber's inner wall. At the top of the chamber's inner wall is the opening leading air out of the chamber and into the annular duct between the outer and inner tubes. The circular flow of the air acts as a centrifuge, forcing the higher mass dust particles outward. The spiraling air also creates a pressure in the dust collector that is above that in the

body of the separation chamber due to kinetic energy of the circulating air. This higher pressure pushes the spiraling air inward, maintaining the air's circular path. However, the dust particles are not inhibited from traveling straight into the collector.

Unlike other vacuum cleaners that employ centrifugal dust separation (e.g., the "cyclone" types discussed previously), the present invention spins the fluid around at the blade speed of the impeller. Thus, the system acts like a high speed centrifuge capable of removing very small particles from the fluid flow. No vacuum bag, liquid bath, or filter is required.

One of the main features of the improved vacuum cleaner is the inherent low power consumption. The losses that must exist when bags or filters are utilized are eliminated here. Bags and filters resist fluid flow, thus requiring greater power to maintain a proper flowrate. Additional efficiency arises from the closed fluid system. Energy supplied by the impeller is not lost because fluid is not expelled into the atmosphere, but is instead retained in the system. Finally, since only smooth changes in the direction of fluid flow are made, the effect on the energy of the moving fluid is minimal. Hence, the disclosed system contains efficiency improvements not

considered by the prior art. Furthermore, the design is expected to be virtually maintenance free.

The efficient features of previous embodiments can be easily adapted to function in other fluids. The present invention, an improved pool cleaner using vortex technology, functions much in the same way as the vortex vacuum cleaners. A brush may be added to the nozzle in order to loosen debris on the pool's surface. Wheels may also be provided to allow the vortex pool cleaner to traverse the pool's surface.

II. **THE EXAMINER'S OBJECTIONS**

The Examiner objected to claims 2-9, 16, 18-19, 22-24, 26, 28-29, and 32-34 for being dependent upon a rejected base claim, but would be allowable if rewritten in independent form incorporating all limitations of their respective base claims.

III. **THE EXAMINER'S REJECTIONS**

The Examiner rejected claims 1, 6, 10-15, 17, 20-21, and 30-31 under 35 U.S.C § 102(b) as being anticipated by Petrenko Pub. No. SU 1664372A (hereinafter "Petrenko"). The Examiner stated that Petrenko teaches a

> "fluid cleaner comprising fluid delivery means (abstract), a toroidal vortex nozzle (5, 6) centrifugally separating matter from a fluid via centrifugal separating means (3), a vent (7) in an annular duct, and recirculating fluid (Figure) through a toroidal vortex nozzle (5, 6) to attract matter with a flowing fluid."

The Examiner rejected claims 1, 6, 13-17, 20-21, and 30-31 under 35 U.S.C. § 102(b) as being anticipated by Beér et al. U.S. Pat. No. 4,539,918 (hereinafter "Beér"). The Examiner stated that Beér teaches a

> "fluid cleaner comprising fluid delivery means (Figure), a toroidal vortex nozzle centrifugally separating matter from a fluid (col. 3, lines 41-50), a removable collector (46), and recirculating fluid (col. 5, lines 1-10)."

The Examiner rejected claims 1 and 5 under 35 U.S.C. § 102(b) as being anticipated by Lerner U.S. Pat. No.

3,895,926 (hereinafter "Lerner"). The Examiner stated that Lerner teaches a

> "fluid cleaner comprising fluid delivery means, a toroidal vortex nozzle (12,18) which may have a rectangular configuration (col. 7, lines 34-38)."

The Examiner rejected claims 25 and 27 under 35 U.S.C. § 102(b) as being anticipated by Sama U.S. Pat. No. 4,290,883 (hereinafter "Sama"). The Examiner stated that Sama teaches a

> "method of cleaning submerged surfaces including the steps of attracting matter with a flowing fluid (abstract), centrifugally separating and loosening matter (col. 3, lines 49-63), and recirculating fluid (col. 1, lines 42-48)."

The Examiner then rejected claim 18 under 35 U.S.C. § 103(a) as being unpatentable over Petrenko in view of De Bernardo U.S. Pat. No. 3,577,711 (hereinafter "De Bernardo"). The Examiner stated that De Bernardo discloses "a removable plug (17) in order to remove accumulated matter from the separator."

Next, the Examiner rejected claim 19 under 35 U.S.C. § 103(a) as being unpatentable over Petrenko in view of Christianson U.S. Pat. No. 5,163,786 (hereinafter "Christianson"). The Examiner stated that Christianson discloses "a door (86) on the collector in order to clean out accumulated matter."

IV. THE EXAMINER'S OBJECTIONS AND REJECTIONS SHOULD BE WITHDRAWN

A. CLAIM OBJECTIONS

The applicants respectfully submit that the Examiner's objections should be withdrawn in view of the foregoing amendments to independent claims 1, 25, and 31 and the following discussion.

B. CLAIM REJECTIONS

Initially, applicants submit that newly amended claim 1 is in condition for allowance. Importantly, the Examiner stated that claim 22 would be allowable if rewritten in independent form including all of the limitations of claim 1. Since limitations substantially similar to those of claim 22 have been integrated into newly amended claim 1, applicants submit that newly amended claim 1 is allowable.

1. CLAIM REJECTIONS UNDER 35 U.S.C. § 102(b)

The Examiner has rejected claims 1, 6, 10-15, 17, 20-21, and 30-31 under 35 U.S.C. § 102(b) as being anticipated by Petrenko. However, Petrenko discloses a device that is significantly different from applicants' invention. Although Petrenko discloses a recirculating fluid flow, the overall flow is constant in nature, i.e., there is an intake and an exhaust. A substantial portion of the fluid is being drawn in from, and expelled to, the surrounding

area. Applicants would like to draw Examiner's attention to the Figure in Petrenko, in which fluid is drawn in through the inlet opening and expelled from pipe **5**. In contrast, applicants' invention utilizes a substantially unit volume of fluid that recirculates within the apparatus, as described in newly amended claims 1, 25, and 31. This method and apparatus varies significantly from Petrenko because maintaining the flow of a unit volume of fluid requires substantially less energy than to impart flow upon a new volume of fluid. Because Petrenko does not teach or suggest this method or apparatus, applicants respectfully submit that the above-mentioned rejections with respect to amended claims 1, 25, and 31 should be withdrawn. Therefore, because dependent claims 6, 13-17, 20, and 30 merely add further limitations, the rejections with respect to those claims should also be withdrawn.

The Examiner has rejected claims 1, 6, 13-17, 20-21, and 30-31 under 35 U.S.C. § 102(b) as being anticipated by Beér. Beér also discloses an apparatus significantly different from applicants' invention. Although Beér discloses a recirculating fluid flow, the overall flow is constant in nature, i.e., there is an intake and an exhaust. A substantial portion of the fluid is being drawn in from the surrounding area and expelled to the

surrounding area. (see Figure in Beér). Beér explains that the combustion air is not entirely recirculated within the combustor, but rather "recuperatively supplied substantially by the swirling inlet annular air flow." (Beér, column 2, lines 25-29). Applicants' invention utilizes a substantially unit volume of fluid that recirculates entirely within the apparatus, as described in newly amended claims 1, 25, and 31. This method and apparatus varies significantly from Beér because maintaining the flow of a unit volume of fluid requires substantially less energy than to impart flow upon a new volume of fluid. Because Beér does not teach or suggest this method or apparatus, applicants respectfully submit that the above-mentioned rejections with respect to amended claims 1, 25, and 31 should be withdrawn. Additionally, because dependent claims 6, 13-17, 20, and 30 merely add further limitations, the rejections with respect to them should also be withdrawn.

Furthermore, the Examiner has rejected claims 1 and 5 under 35 U.S.C. § 102(b) as being anticipated by Lerner. Lerner discloses an apparatus that is significantly different from applicants' invention because it does not utilize a recirculating fluid flow. Lerner explains that the gas:

> "continually enters and leaves the primary vortex **46** and the secondary vortex **48** and flows upwardly through the vessel **12** and through the mist eliminator pad **44** and is exhausted to the atmosphere." (Lerner, column 4, lines 54-57).

Thus, Lerner teaches a constant flow device. In clear distinction, applicants' invention utilizes a substantially unit volume of fluid that recirculates within the apparatus. This method and apparatus varies significantly from Lerner because maintaining the flow of a unit volume of fluid requires far less energy than to impart flow upon a new volume of fluid. Because Lerner does not teach or suggest this method or apparatus, applicants respectfully submit that the above-mentioned rejection with respect to amended claim 1 should be withdrawn.

Finally, the Examiner has rejected claims 25 and 27 under 35 U.S.C. § 102(b) as being anticipated by Sama. However, Sama teaches a device that is significantly different from applicants' invention. Sama utilizes a rotating fluid flow to create a small pressure drop sufficient to attract light debris, but is unable to attract heavy debris. Sama explains that "dirt and debris are entrained and swept away by the flow, but not the denser gravel." (Sama, abstract). Thus Sama simply uses a very small attractive force to only attract light debris. The fluid is then pumped through tubes and filtered before

being returned to the chamber. (Sama, column 1, lines 42-48). Additional energy is required to force a fluid through a filter, thereby reducing the efficiency of the process. Applicants' invention separates debris centrifugally, and therefore does not require the use of filters. Because Sama does not teach or suggest anything approaching the scope of the present invention, applicants respectfully submit that the above-mentioned rejection with respect to claim 25 should be withdrawn.

2. CLAIM REJECTIONS UNDER 35 U.S.C. § 103(a)

The Examiner has rejected claim 18 under 35 U.S.C. § 103(a) as being unpatentable over Petrenko in view of De Bernardo. In view of the foregoing amendments, applicants submit that Petrenko is irrelevant for the purposes of § 103(a). Since claim 18 is dependent on claim 1, which applicants submit is in condition for allowance, and contains all of the limitations thereof, applicants submit that claim 18 is in condition for allowance.

Also, the Examiner has rejected claim 19 under 35 U.S.C. § 103(a) as being unpatentable over Petrenko in view of Christianson. In view of the foregoing, applicants submit that Petrenko has been rendered irrelevant for purposes of § 103(a). Since claim 19 is also dependent on claim 1 and contains all of the limitations thereof,

applicants submit that claim 19 is in condition for allowance.

In light of the foregoing amendments and remarks, applicant submits that the present application is now in condition for allowance.

CONCLUSION

Applicants submit that all pending claims represent a patentable contribution to the art and are in condition for allowance. Early and favorable action is accordingly solicited.

Respectfully submitted,

Date: 11/19/03

John W. Olivo, Jr.
Reg. No. 35,634
Ward & Olivo
382 Springfield Ave.
Summit, NJ 07901
908-277-3333